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Ecology of Residential Buildings of Kyzylorda City

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Abstract: The article describes a research work on a topic: "Ecology of Residential Buildings of Kyzylorda city". Milestones: introduction to literary sources; visit the necessary objects and organizations for complete study of the modern "ecofriendly" state of buildings in Kyzylorda city; the study of dwellings layout of Kyzylorda city; inquiry of citizens to reveal the environmental awareness with regard to creation the favorable conditions for human life and activity; obtaining the necessary results. The summary of the whole work is reflected in the conclusions, containing the main ways of creation the "relatively ecofriendly", favorable for human life dwellings. The conclusions can be combined into two groups. 1. Promotion of ecological way of life (introduction of environmental education in schools; acquaintance with the major methods of creation a favorable microclimate in dwellings; acquaintance with domestic flora) 2. Construction of "relatively ecofriendly" houses (use only "ecofriendly" construction materials; maintenance of required sizes and orientations in the construction).

Key words: Types of houses · Layout · Relative environmental friendliness · Factors of physical · Chemical and biological nature

INTRODUCTION

Accelerated urbanization is a peculiarity of the modern age. Due to high growth of urban population, the concentration of production and non-production activity increases. It makes the environment of the majority of cities dissatisfactory for many biological and social human demands [1-8]. The reason of high ecological tension is the fact, that the urban territories have an intensive anthropogenic load with overlap of several negative factors; they are also characterized by the high population density [9]. At the present time 56% of Kazakhstan population lives in cities. The results of medical-demographical situation of the last decade revealed, that, despite the level of city public health services (as a rule, it is higher, than in rural area), the index of total mortality for the urban citizens is higher. It proves once again, that the urban environment forms negative factors, influencing on the people's health. That is why there is a necessity in many-sided discovery of ways to improve the urban environment. In Kazakhstan much attention is paid to the urbanization problems; many scientific organizations are involved into searching the positive solutions of these matters [10]. However, these problems are especially urgent for the students of ecological speciailties. Involving the students into such kind of work, we, first of all, prepare competent staff, able to plan the work on study of the ecological situation of a definite settlement. That is why during the field trip the students-environmental specialists, starting from the second course, are involved into scientific-research work on the study of human environment. A peculiar progress report is the presentation at student conferences of the university and getting the additional points to the mark for practice. Let us consider as an example one of the scientific works on a topic: Ecology of residential buildings of Kyzylorda city.

The purpose of investigation is to study the ecology of residential buildings of Kyzylorda city.

MATERIALS AND METHODS.

The material was collected during 2011-2012. The houses of Kyzylorda city were studied. A scientific-research work had the five stages:

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Work with literary sources;
Visit:

- LLP Project - a construction company and CD;
- Statistical Department of Kyzylorda city;
- Study of the layout of dwellings in Kyzylorda city;
- Inquiry of Kyzylorda citizens to reveal the ecological culture of the population with regard to creation the favorable conditions for human life and activities;
- Obtaining the results and their discussion.

RESULTS AND DISCUSSION

Kyzylorda is a city in Kazakhstan, its length is 4014 km. Urban climate differs by sharp continentality, having the following characteristics:

- Plenty of heat and domination of fair dry weather;
- Soil salination;
- Rather low relative air humidity combined with strong hot winds in a day-time;
- Near full absence of precipitates in some years [11, 12].

Based on the presented data, from the ecological point of view, one-sided layout of flats is impossible in Kyzylorda. Investigations of site development data showed, that today there are several types of houses in Kyzylorda:

- One-flat single-storeyed;
- One-flat, two-storeyed (cottages);
- Low-rise, high-rise apartment blocks [Photo 1].

Of course, the most attractive from the hygienic point of view are one- or two-storeyed buildings for one family. Such site development provides good incoming solar radiation and air exchange, favorable microclimate, possibility to use the garden and outdoor rest. However, such site development requires significant means for roads, laying of water supply and sewage lines, power and gas supply, resulting in environmental intervention.

At Present in Kyzylorda:

- 60% are the houses of private sector. They have double-sided layout. Based on this feature, they are considered to be "relatively ecofriendly" and the most attractive from the hygienic point of view;
- 40% are the staged buildings;
- From 40% of staged buildings, 10% (mainly in the city center have the one-sided layout and are "relatively non-ecofriendly" and the most unattractive from the hygienic point of view).

At the present time there is an active construction of the city in Kyzylorda; the houses of the private sector prevail. To build the houses in Kyzylorda city, the following construction materials are used: brick, wood, tiling, iron, air-brick, bulrush and linoleum.

Free layout and improved layout prevail in construction of multi-storeyed buildings. As per the data of the Table 1 (if all the staged buildings are considered as 100%), there is the following situation. The houses of free and improved layout (which constitute 60% in the city) can not be called "relatively ecofriendly", as the "non-ecofriendly" materials are used in construction: panels and linoleum. Low height of buildings is recorded. The houses of Stalin and Leningrad projects, which constitute only 17%, belong to the category of "relatively ecofriendly" (Table 1).

To build in Kyzylorda "relatively ecofriendly" houses, meeting the sanitary-hygienic requirements and having no negative impact on environment, it is necessary:

To Construct High-rise Buildings (Using the Ecologic Construction Materials) With:

- 0ide halls, large rooms at two levels, recessed and protruding balconies, with slightly sloping stairs, keeping the ordinary step length of an adult;
- Heating and ventilation systems.

When carrying out the field trips for students of environmental speciailties, we do our best for the students to get all the necessary skills not only according to the oral information of the teacher, but acquire some practical skills by themselves. That is why in the field trip organization much attention is paid to the right formulation of an individual work of a student on the definite tasks. Individual tasks are given taking into account the students interests and requests. Coming to the second stage of the work, each student prepares the questionnaires for inquiry of Kyzylorda citizens, as well as the main material for conversation. The inquiry and explanatory conversation include the following topics:

Table 1: Percentage ratio of flat types in Kyzylorda and their ecologic evaluation.

No	Type of flat	% Site development	Brief ecologic characteristic
1	Stalin project	5	Resistance of construction: walls, floors. High parameters: noise and heat insulation, ceilings, flat area. Main construction material: asbestos-cement boards, wood, brick.
2	Khruschev project	4	Resistance of construction. Main construction parameters: low attic space; ceiling height is 2,48; panel walls; low noise and heat insulation of partitions.
3	Leningrad project	12	Construction from ecologically clean materials: brick, wood, asbestos-cement boards, large area and height of flats.
4	Improved layout	35	Multi-storeyed, constriction material is mainly panel, large area.
5	New layout	19	Multi-storeyed, constriction material is mainly brick, wood. Large area and height of dwellings.
6	Free layout	25	Multi-storeyed, one area with high ceiling, only exterior bearing walls, sanitary facilities. Construction material is mainly panel.

(1) (2) (3) (4)

Photo 1: Types of houses in Kyzylorda city: 1. one-flat single-storeyed; 2. one-flat, two-storeyed; 3. high-rise apartment blocks; 4. low-rise apartment.

Factors of Physical Nature, Affecting the Human Dwelling:

- Solar radiation and natural illumination;
- Electromagnetic radiation of the dwelling;
- Noise;

Factors of Chemical Nature, Affecting the Human Dwelling:

- Quality of construction materials;
- Conditions of flat ventilation;

Factors of Biological Nature, Affecting the Human Dwelling:

- Dust and bacterial suspension.

To Simplify the Summary, We Combined the Main Topics of the Inquiry into Three Main Categories:

- Factors of physical nature, affecting the human dwelling; 2. Factors of chemical nature, affecting the human dwelling; 3. Factors of biological nature, affecting the human dwelling.

Combined Questionnaire on a Topic: Factors of physical nature, affecting the human dwelling.

- What does the heat and light level in a flat depend on?
- What is the role of sun for a human dwelling?
- What forms a common electric smog in a flat?
- How is possible to reduce the expose to EMR (electromagnetic radiation)?
- Name a safe distance for a person from the radiation source: power transmission lines, computer monitoring; digital clock near your pillow; mobile phone.
- At what age do children can use mobile phones?
- How is possible to fight with noise in a flat?

The analysis of the inquiry on a topic: Factors of physical nature, affecting the human dwelling, showed that:

All Respondents Agree, That:

- Light and heat in the flat depend on right orientation of the dwelling;
- Sun has a disinfect property;

50% of citizens can not give a right answer to the question 3; 3.60% had difficulties when answering the questions 4,5,6; Unconvincing were the answers to the question 7;

Combined Questionnaire on a Topic: Factors of chemical nature, affecting the human dwelling.

- What finishing materials are dangerous?
- Name ecologically clean finishing materials?
- How is possible to clean flat air from the contaminants inside the room?
- Are you familiar with the technology of photocatalytic air cleaning?

The analysis of the inquiry on a topic: Factors of chemical nature, affecting the human dwelling, showed that:

- 37% are aware of the ecofriendly construction materials, moreover, the 37% constitutes the group of people aged from 25 to 47 years;
- Being aware of ecofriendly materials, 27% of 37% continue buying cheaper non-ecofriendly ones;
- All respondents consider wood, brick, air-brick and bulrush to be the best construction materials;
- All respondents agree, that to create the favorable conditions for air exchange, ventilation and weekly wet cleaning are required;
- 1% is aware of the technology of photocatalytic air cleaning. 4% is aware of the method of vacuum cleaner method;

Combined Questionnaire on a Topic: Factors of biological nature, affecting the human dwelling.

- Is dust dangerous for rooms?
- What do you know about microscopic mites Dermatophagoides Bogdanov, (1864)?
- What is the source of appearance of microscopic mites (Dermatophagoides)?
- Are the houseplants necessary?
- What is the role of houseplants?

The analysis of the inquiry on a topic: Factors of biological nature, affecting the human dwelling, showed that:

All Respondents Agree, That:

- Dust is dangerous for the room;
- Plants evolve oxygen into the environment and absorb carbon dioxide. Only 45% agree, that plants are the air cleaners;
- There shall be plants in the house. Ficus benjamina Linnaeus (1767) and Ficus elastica Roxburgh (1832) are in preference (30%);

80% knew nothing about microscopic mites (Dermatophagoides) and the sources of their emergence. Despite the fact, that the culture of Kazakh nation has a tradition of weekly ventilation of bedclothes, bedcovers, runners and carpets.

The demonstrated investigations allow the students, first of all, to get the practical skills on:

- Evaluation of the houses ecology in Kyzylorda city;
- Acquaintance with literature on the concerned topics;
- Work with population;
- Assimilation of modern investigation methods.

Thus, constant involvement in specifically directed research activity in the period of field trip creates the favorable conditions for development of a student-ecologist as a specialist on environment protection.

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